$\underline{\text{CLAIMS}}$

What is claimed is:

1	1.	A method for matrix transposition, the method comprising:
2		rotating in a vector register a first row of a matrix to generate a first row of
3		elements;
4		writing simultaneously into a plurality of look up units the first row of
5		elements indexed by a first row of indices in a vector register;
6		looking up simultaneously from the plurality of look up units a second row
7		of elements indexed by a second row of indices in a vector register;
8		and
9		rotating in a vector register the second row of elements to generate a third
10		row of elements.
1	2.	A method as in claim 1 wherein each element of the matrix comprises a
2		plurality of bit segments, each of which is written into an entry of a different
3		unit of the plurality of look up units.
1	3.	A method as in claim 1 wherein the plurality of look up units are configured
2		into a plurality of look up tables in response to receiving an instruction for
3		looking up a row of elements.

1	4.	A method as in claim 1 further comprising:
2		concurrently rotating in a vector register a second row of matrix to generate a
3		forth row of elements while writing the first row of elements.
1	5.	A method as in claim 4 wherein a row that needs no rotation is written into
2		look up units before other rows are written into the look up units.
1	6.	A method as in claim 4 further comprising:
2		concurrently computing a third row of indices using the first row of indices
3		while writing the first row of elements.
1	7.	A method as in claim 6 further comprising:
2		concurrently loading a row of the matrix from memory into a vector register
3		while writing the first row of elements.
1	8.	A method as in claim 6 wherein:
2		the first row of indices are a first constant;
3		the third row of indices are a second constant; and
4		the first and second constants differ by one.
1	9.	A method as in claim 6 wherein the third row of indices is a result of a
2		rotation of the first row of indices.

1	10.	A method as in claim 1 further comprising:
2		concurrently rotating in a vector register a fifth row of elements to generate a
3		forth row of elements while looking up the second row of elements.
1	11.	A method as in claim 10 wherein a row of elements that needs no rotation is
2		looked up from the plurality of look up units after other rows are looked up
3		from the plurality of look up units.
1	12.	A machine readable media containing executable computer program
2		instructions which when executed by a digital processing system cause said
3		system to perform a method for matrix transposition, the method comprising:
4		rotating in a vector register a first row of a matrix to generate a first row of
5		elements;
6		writing simultaneously into a plurality of look up units the first row of
7		elements indexed by a first row of indices in a vector register;
8		looking up simultaneously from the plurality of look up units a second row
9		of elements indexed by a second row of indices in a vector register;
10		and
11		rotating in a vector register the second row of elements to generate a third
12		row of elements.

A media as in claim 12 wherein each element of the matrix comprises a

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2		plurality of bit segments, each of which is written into an entry of a different
3		unit of the plurality of look up units.
1	14.	A media as in claim 12 wherein the plurality of look up units are configured
2		into a plurality of look up tables in response to receiving an instruction for
3		looking up a row of elements.
1	15.	A media as in claim 12 wherein the method further comprises:
2		concurrently rotating in a vector register a second row of matrix to generate a
3		forth row of elements while writing the first row of elements.
1	16.	A media as in claim 15 wherein a row that needs no rotation is written into
2		look up units before other rows are written into the look up units.
1	17.	A media as in claim 15 wherein the method further comprises:
2		concurrently computing a third row of indices using the first row of indices
3		while writing the first row of elements.
1	18.	A media as in claim 17 wherein the method further comprises:
2		concurrently loading a row of the matrix from memory into a vector register
3		while writing the first row of elements.

A media as in claim 17 wherein:

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2		the first row of indices are a first constant;
3		the third row of indices are a second constant; and
4		the first and second constants differ by one.
1	20.	A media as in claim 17 wherein the third row of indices is a result of a
2		rotation of the first row of indices.
1	21.	A media as in claim 12 wherein the method further comprises:
2		concurrently rotating in a vector register a fifth row of elements to generate a
3		forth row of elements while looking up the second row of elements.
1	22.	A media as in claim 21 wherein a row of elements that needs no rotation is
2		looked up from the plurality of look up units after other rows are looked up
3		from the plurality of look up units.
1	23.	A processing system for matrix transposition, the system comprising:
2		means for rotating in a vector register a first row of a matrix to generate a
3		first row of elements;
4		means for writing simultaneously into a plurality of look up units the first
5		row of elements indexed by a first row of indices in a vector register;
6		means for looking up simultaneously from the plurality of look up units a
7		second row of elements indexed by a second row of indices in a
8		vector register; and

9		means for rotating in a vector register the second row of elements to generate
10		a third row of elements.
1	24.	A processing system as in claim 23 wherein each element of the matrix
2		comprises a plurality of bit segments, each of which is written into an entry
3		of a different unit of the plurality of look up units.
1	25.	A processing system as in claim 23 wherein the plurality of look up units are
2		configured into a plurality of look up tables in response to receiving an
3		instruction for looking up a row of elements.
1	26.	A processing system as in claim 23 further comprising:
2		means for concurrently rotating in a vector register a second row of matrix to
3		generate a forth row of elements while writing the first row of
4		elements.
1	27.	A processing system as in claim 26 wherein a row that needs no rotation is
2		written into look up units before other rows are written into the look up units
1	28.	A processing system as in claim 26 further comprising:
2		means for concurrently computing a third row of indices using the first row
3		of indices while writing the first row of elements.

1	29.	A processing system as in claim 28 further comprising:
2		means for concurrently loading a row of the matrix from memory into a
3		vector register while writing the first row of elements.
1	20	A companying southern in 1 in 20, 1
1	30.	A processing system as in claim 28 wherein:
2		the first row of indices are a first constant;
3		the third row of indices are a second constant; and
4		the first and second constants differ by one.
1	31.	A processing system as in claim 28 wherein the third row of indices is a
2		result of a rotation of the first row of indices.
1	32.	A processing system as in claim 23 further comprising:
2		means for concurrently rotating in a vector register a fifth row of elements to
3		generate a forth row of elements while looking up the second row of
4		elements.
1	33.	A processing system as in claim 32 wherein a row of elements that needs no
2		rotation is looked up from the plurality of look up units after other rows are
3		looked up from the plurality of look up units.

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A processing system for matrix transposition, the system comprising:

2		a vector register file comprising a plurality of vector registers;
3		a vector processing unit coupled to the vector register file, the vector
4		processing unit comprising a vector look up unit, the vector look up
5		unit comprising a plurality of look up units adapted to look up a
6		vector of data items simultaneously, the vector processing unit:
7		rotating in a vector register in the vector register file a first row of a matrix to
8		generate a first row of elements;
9		writing simultaneously into the plurality of look up units the first row of
10		elements indexed by a first row of indices in a vector register in the
11		register file;
12		looking up simultaneously from the plurality of look up units a second row
13		of elements indexed by a second row of indices in a vector register in
14		the register file; and
15		rotating in a vector register in the vector register file the second row of
16		elements to generate a third row of elements.
1	35.	A processing system as in claim 34 wherein each element of the matrix
2		comprises a plurality of bit segments, each of which is written into an entry
3		of a different unit of the plurality of look up units.
1	36.	A processing system as in claim 34 wherein the plurality of look up units are
2		configured into a plurality of look up tables in response to receiving an
3		instruction for looking up a row of elements.

- 1 37. A processing system as in claim 34 wherein the vector processing unit 2 concurrently rotates in a vector register a second row of matrix to generate a
- forth row of elements while writing the first row of elements.
- 1 38. A processing system as in claim 37 wherein a row that needs no rotation is
 2 written into look up units before other rows are written into the look up units.
- 1 39. A processing system as in claim 37 wherein the vector processing unit 2 concurrently computes a third row of indices using the first row of indices 3 while writing the first row of elements.
- 1 40. A processing system as in claim 39 wherein the vector processing unit 2 concurrently loads a row of the matrix from memory into a vector register 3 while writing the first row of elements.
- 1 41. A processing system as in claim 39 wherein:
- 2 the first row of indices are a first constant;
- 3 the third row of indices are a second constant; and
- 4 the first and second constants differ by one.
- 1 42. A processing system as in claim 39 wherein the third row of indices is a result of a rotation of the first row of indices.

- 1 43. A processing system as in claim 34 wherein the vector processing unit
- 2 concurrently rotates in a vector register a fifth row of elements to generate a
- forth row of elements while looking up the second row of elements.
- 1 44. A processing system as in claim 43 wherein a row of elements that needs no
- 2 rotation is looked up from the plurality of look up units after other rows are
- looked up from the plurality of look up units.